R&S®BBA150
Broadband Amplifier
Excellent amplifiers from 9 kHz to 6 GHz with high power density

ROHDE&SCHWARZ

Test & Measurement

Product Brochure | 06.00

R&S®BBA150 Broadband Amplifier

At a glance

The R&S®BBA150 broadband amplifier family generates power in the frequency range from 9 kHz to 6 GHz. The compact amplifiers are rugged and feature high availability. They are ideal for amplitude, frequency, phase and pulse modulation. Extensive switching options for input, output and sample ports are available for different applications.

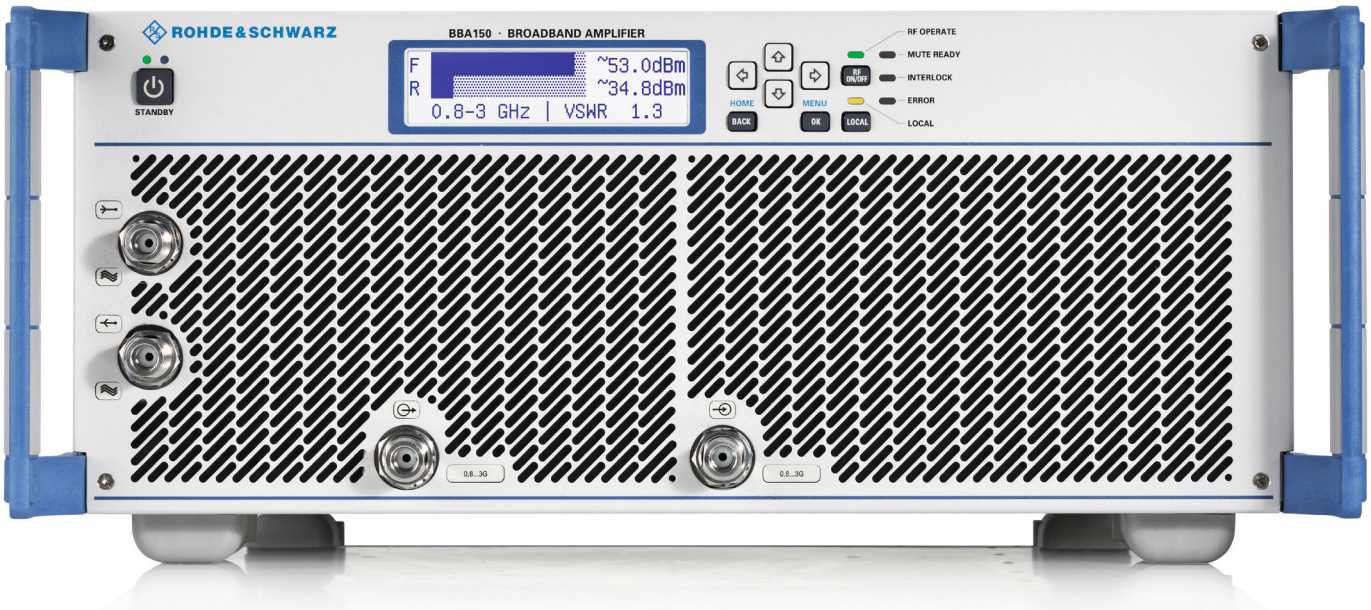
The R&S®BBA150 broadband amplifiers cover a total of four frequency bands: 9 kHz to 250 MHz, 80 MHz to 1 GHz, 0.8 GHz to 3 GHz and 2.5 GHz to 6 GHz. They can be used to address a variety of applications, including the various standards for EMS measurements up to 6 GHz. In the industry environment, the R&S®BBA150 broadband amplifiers are suitable for development and product validation tests in quality assurance and in the development and production of components. Other fields of use include research, physical engineering and communications.

The R&S®BBA150 broadband amplifiers are based on a modular, lightweight design that is optimized for the required frequency band. They are available in two versions. The low-power amplifier comes as a 4 HU 19" rackmount that can be used as a desktop model or installed in a rack. Devices with higher power must be installed in racks. The amplifiers are operated either using display and buttons, or via remote control interface (automated operation) or via a web browser.

The modular concept is a prerequisite for upgrading power and frequency range later on. The worldwide service concept and the global availability of spare parts promote the trust and confidence of customers.

Key facts

- Frequency bands: 9 kHz to 250 MHz, 80 MHz to 1.0 GHz, 0.8 GHz to 3.0 GHz, 2.5 GHz to 6.0 GHz
- Output power from 15 W to 3000 W
- 100 % mismatch tolerance
- Suitable for amplitude, frequency, phase and pulse modulation
- Three-year warranty and worldwide spare parts availability



R&S®BBA150 Broadband Amplifier

Benefits and key features

One of the most advanced broadband amplifiers on the market

- Sophisticated RF design
- Compact and lightweight
- Series production in one of Europe's most progressive plants

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Reliable with high availability

- Outstanding expertise in amplifier development
- Cost benefit due to low downtime

▷ page 5

Flexible control and operation

- Manual operation
- Local and remote operation via web browser and PC
- Integration into the R&S®EMC32 EMC measurement software
- Remote control via Ethernet
- Safety thanks to two different interlocks

▷ page 6

All in one device

- Compact design and modular structure
- Extensive switching options for inputs, outputs and sample ports

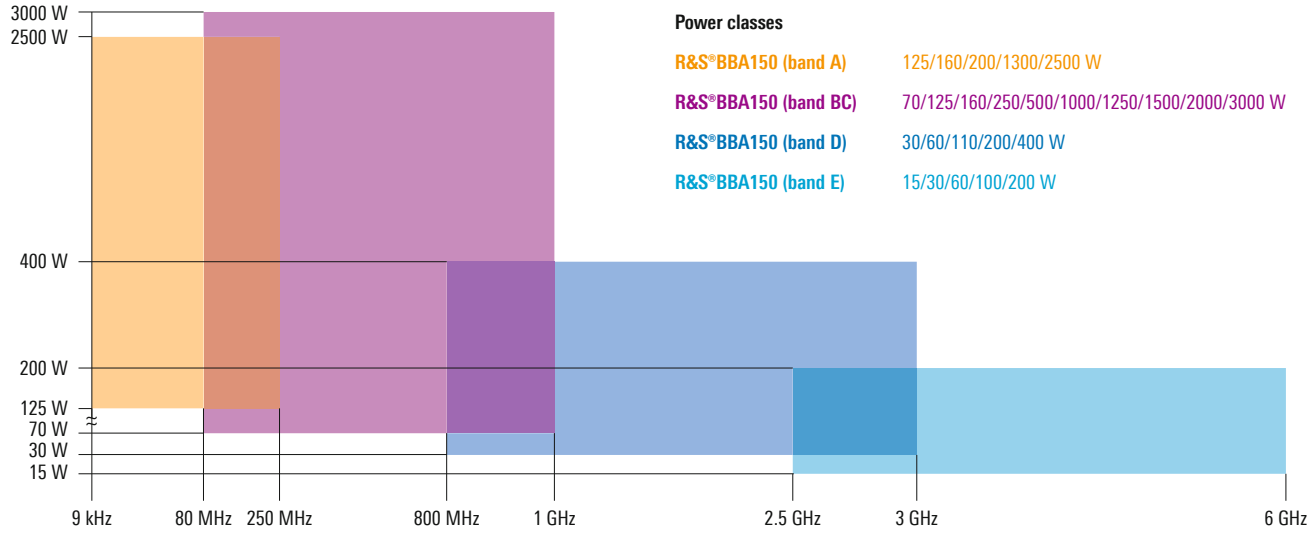
▷ page 8

Excellent service and quick maintenance

- Outstanding service concept
- Extended warranty for maximum protection of investment
- From pre-sale to service – at your doorstep

▷ page 10

Model overview



One of the most advanced broadband amplifiers on the market

Outstanding RF design in combination with high-quality series production in one of Europe's most progessive plants

Sophisticated RF design

State-of-the-art design and simulation programs used during development, the use of power semiconductors from internationally leading manufacturers and the decades of experience of the Rohde&Schwarz engineers in developing amplifiers produce the most advanced amplifier design currently available. In the frequency band from 2.5 GHz to 6 GHz, semiconductor dice directly bonded onto printed boards make it possible to achieve high output power. As a result, parasitic effects caused by housed transistors are avoided.

Efficiency coupled with ruggedness ensures smooth operation. Lean firmware with effective monitoring and protection mechanisms provides operational safety. Generous dimensioning of the RF amplifier stages provides sufficient margin and ensures compliance with warranted data sheet parameters.

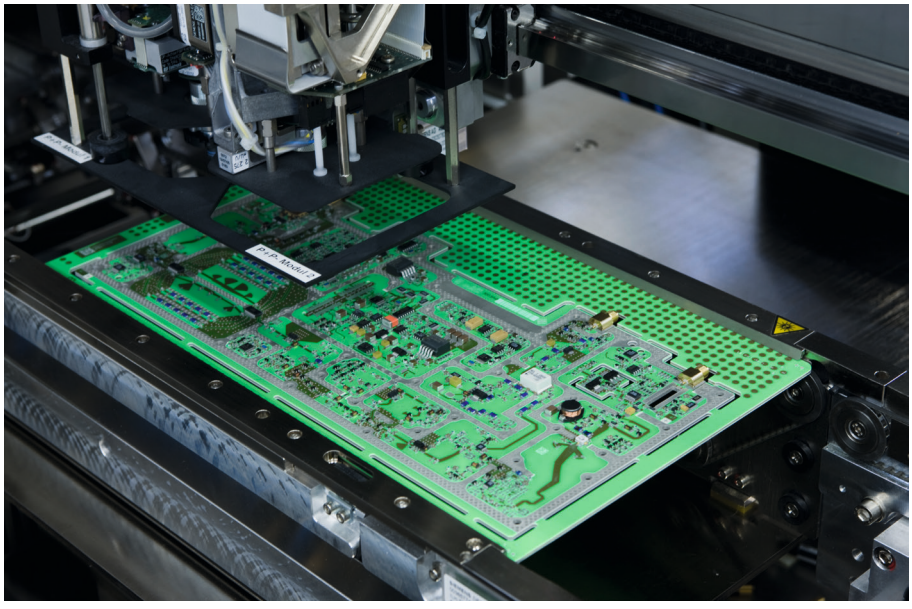
Compact and lightweight

The R&S®BBA150 also sets new standards in terms of mechanical design. Due to its lightweight design and special aluminum-copper heat sink, the R&S®BBA150 weighs only half as much as conventional amplifiers in the same power class. If desired, it is possible to combine different frequency bands in a single amplifier. The RF output power of up to 500 W below 1 GHz and up to 200 W above 1 GHz in just four height units means excellent power density.

Series production in one of Europe's most progressive plants

The R&S®BBA150 broadband amplifiers are series-produced in one of Europe's most progressive plants. The multiple award-winning [1] Rohde&Schwarz plant in the town of Teisnach (Germany) offers superior manufacturing depth. From precision mechanical engineering and metalworking to printed board production and final assembly, all manufacturing steps are united under the same roof. Automated final test setups ensure that the Rohde&Schwarz plant delivers only specification-compliant products to its customers.

[1] Awards received by the Rohde&Schwarz Teisnach plant include:
- 2010, 2014 Factory of the Year, Germany
- 2013 Best Factory, award winner of European industrial excellence competition
- 2014 Bavarian Quality Award



Automated insertion of components into printed boards at Rohde&Schwarz.

Reliable with high availability

Broadband amplifiers as reliable as the sound and TV broadcast transmitters from Rohde&Schwarz

Outstanding expertise in amplifier development

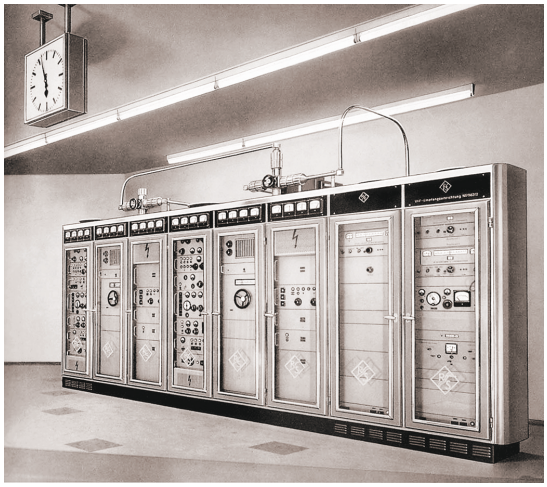
The R&S®BBA150 broadband amplifiers are highly tolerant to mismatch and rugged enough to handle short-circuiting at the RF end or an open RF output. The expertise gained over many years in the development of power amplifiers is based on the R&D work for Rohde&Schwarz sound and TV broadcast transmitters. Their reliability is well-known and a major reason for the company's global market leadership in digital terrestrial transmitter technology.

Cost benefit due to low downtime

The market launch of the R&S®BBA100 broadband amplifier family in 2010 underscored the Rohde&Schwarz claim to offer stable, reliable amplifiers for maximum customer benefit. Low downtime is an important economic factor. The R&S®BBA150 broadband amplifiers are the next logical step along this path.

Transfer of know-how

All the Rohde&Schwarz sound and TV broadcast transmitter manufacturing know-how has gone into the development of the broadband amplifiers.



1963:
VHF FM sound broadcast transmitter with 2 × 5 kW

2010:
R&S®BBA100
broadband amplifier

2013:
R&S®BBA150
broadband amplifier

2014:
R&S®BBL200
broadband amplifier

Flexible control and operation

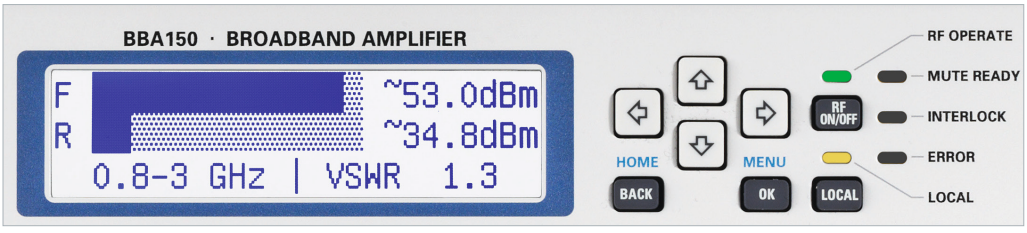
Operation of the R&S®BBA150 is always efficient, including local and remote control and operation via web GUI.

Manual operation

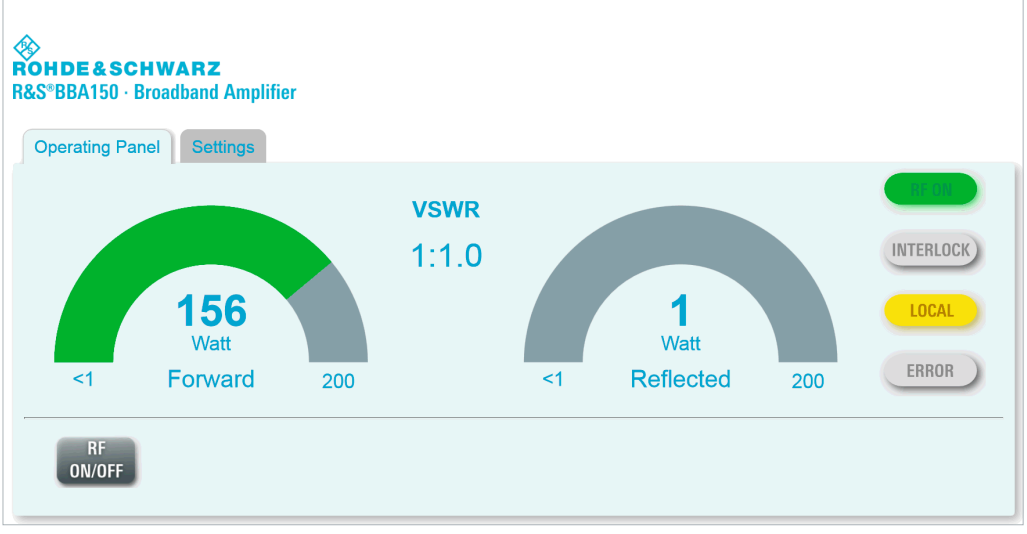
The R&S®BBA150 is directly operated via the display and the buttons on its front panel. This is ideal for use in labs and makes it easy to change settings. A clever menu structure provides straightforward access to all essential information and possible settings; during operation, the RF output power, reflected power and VSWR are displayed.

Local and remote operation via web browser and PC

The web GUI integrated into the R&S®BBA150 is called up via LAN and web browser. The R&S®BBA150 can be conveniently operated via its graphical user interface using a laptop near the amplifier or a control workstation PC. A common web browser (e.g. Google Chrome, Mozilla Firefox, Microsoft Internet Explorer) is all that is needed.



Display and buttons on the R&S®BBA150 front panel.



Operating panel in the web GUI of the R&S®BBA150.

Integration into the R&S®EMC32 EMC measurement software

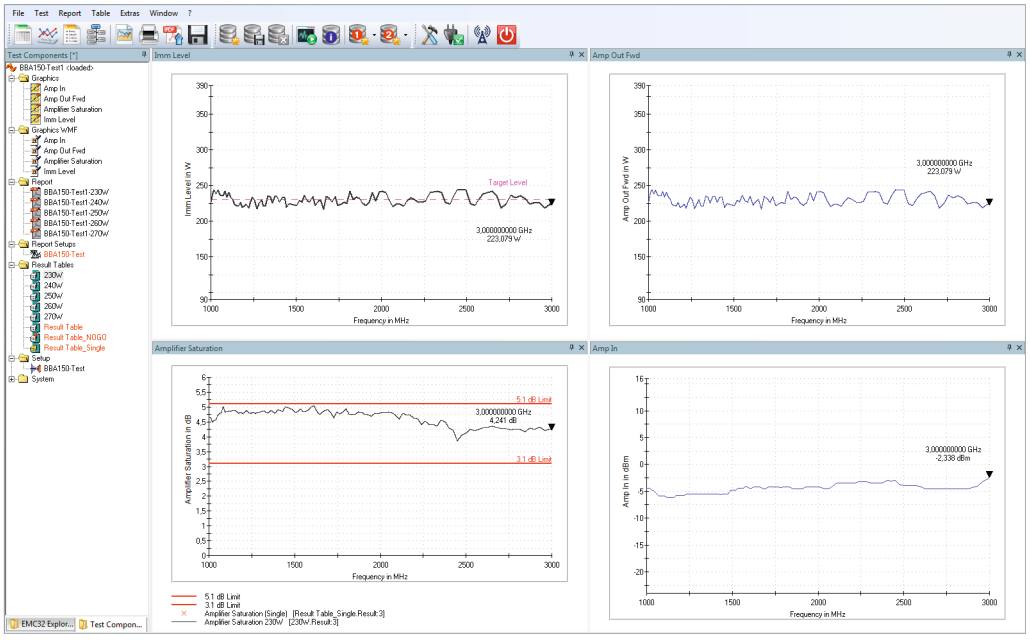
Complex EMC measurement scenarios almost always require the use of higher-level measurement and control software, for example R&S®EMC32. The complete integration of the R&S®BBA150 into the EMC measurement software offers many different options for setting and controlling the amplifier for immunity measurements in line with common standards such as CISPR, IEC, ISO, EN, ETSI, VDE, FCC and ANSI.

Remote control via Ethernet

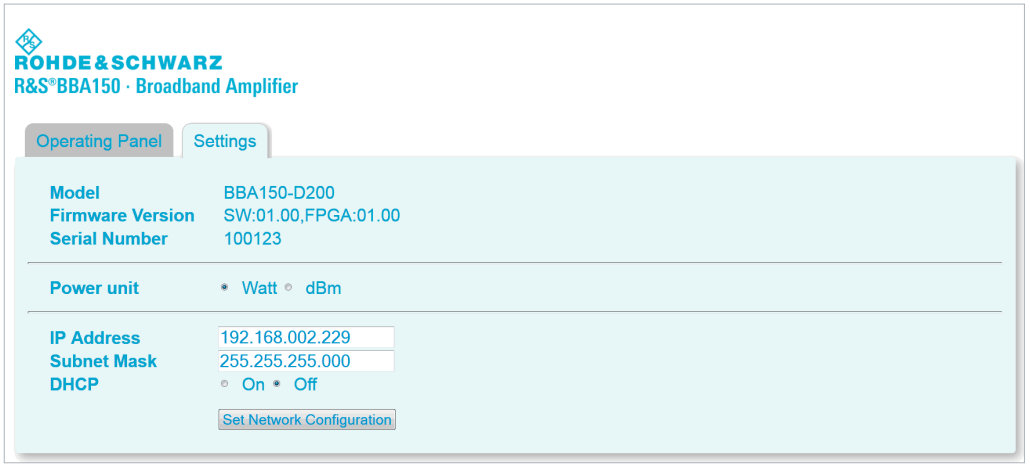
The standard Ethernet interface makes it possible to automate test sequences by remote control commands in line with the SCPI nomenclature. TCP/IP networks are now standard for networking and controlling equipment; separate infrastructure is no longer needed. To make integration especially easy, the R&S®BBA150 allows an IP network address to be set manually or assigned automatically via DHCP.

Safety thanks to two different interlocks

The obligatory device interlock is complemented by another, configurable interlock. The device interlock restarts the amplifier without user interaction as soon as the circuit is closed. The configurable interlock requires a confirmation, either locally on the R&S®BBA150 or via remote control command, before RF power can be output again. This function ensures maximum possible safety and convenient operation.



R&S®EMC32 EMC measurement software.



Settings panel in the web GUI of the R&S®BBA150.

All in one device

The system controller makes it possible to implement amplifier systems with different frequency bands without external control components.

Compact design and modular structure

Though compact, the R&S®BBA150 broadband amplifier offers functions that normally involve significantly higher technical investment. The design is optimized for top flexibility in a small footprint. The compact, modular design of the amplifier stages and other components allows the set-up of highly integrated systems based on 19" rackmounts. The rackmounts are scalable such that even complex systems have compact dimensions.

Extensive switching options for inputs, outputs and sample ports

The R&S®BBA150 broadband amplifiers make it possible to integrate different frequency bands into a single amplifier system. The components listed below can be combined as required, providing a unique degree of flexibility when designing amplifier systems.

The input switch is used to connect the RF input signal (e.g. from a signal generator) to one of the frequency bands. As a result, a central input can be used without reconnecting the signal source.

The R&S®BBA150-D110E100 amplifier system is very compact. The rackmount with a height of only 4 HU contains the following:

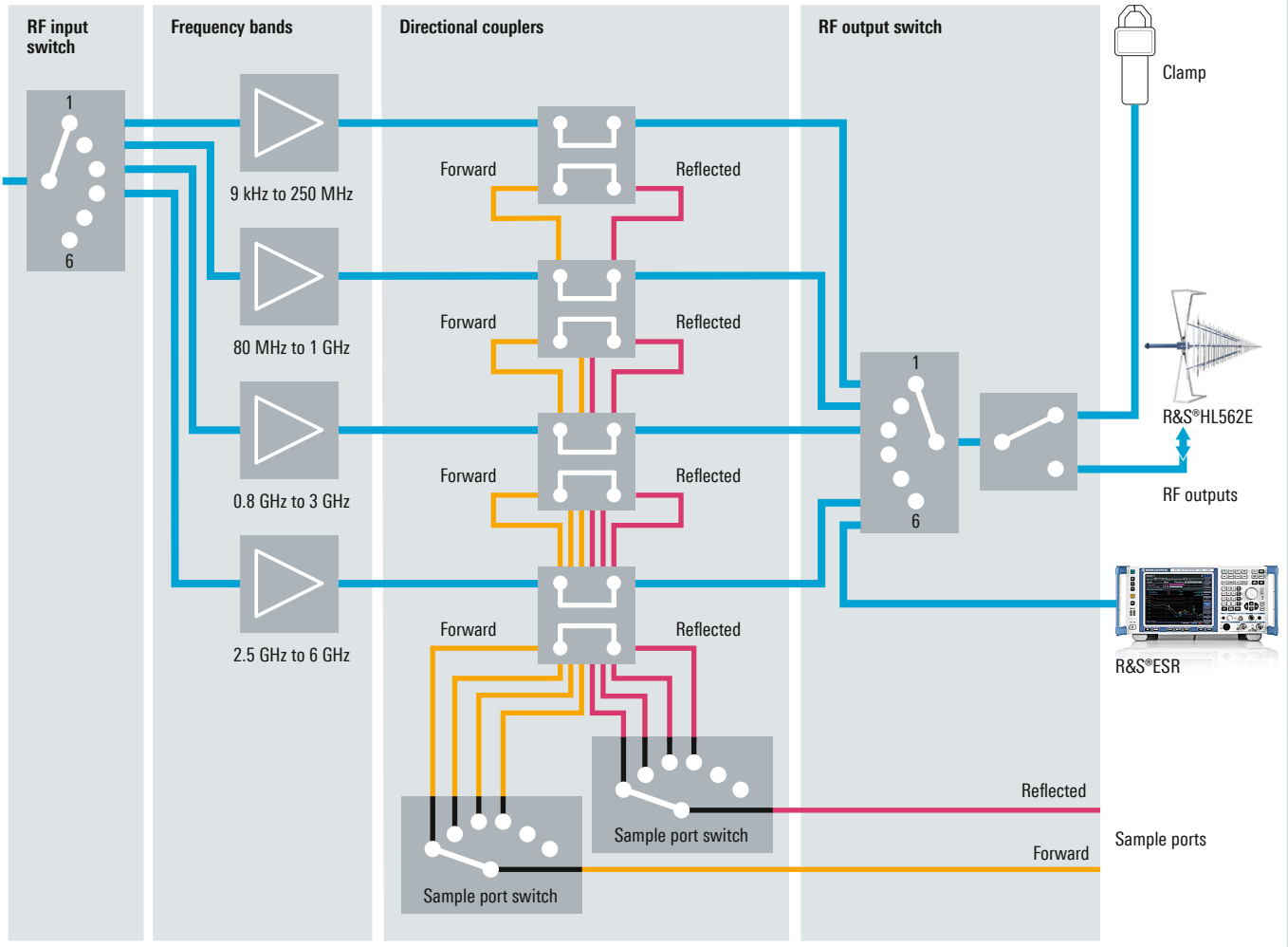
- Power amplifier, frequency band D, 110 W
- Power amplifier, frequency band E, 100 W
- Input switch
- Output switch
- Sample port switch

Optional sample ports are available to measure the forward and reflected power at the amplifier's output. Sample port switches are used to make the sample port signals from the different frequency bands available at two central outputs.

RF output switches allow flexible connection of the frequency bands to different sinks, e.g. clamps or antennas. Different RF output switches can be configured in an application-specific manner.

All switches in the system are controlled via the built-in system controller. The desired RF path can be selected with a single remote control command or press of a button. An RF path represents the signal path from the input to the output of the amplifier system.

Combined amplifier system with switching options



Excellent service and quick maintenance

Minimal downtime due to modular design and worldwide service

Outstanding service concept

The modular structure of the R&S®BBA150 allows problems to be remedied quickly and keeps downtime to a minimum. All of the amplifier's components are designed as modules and can usually be replaced at the local Rohde&Schwarz office or the nearest service center. Spare parts are available worldwide.

If the problem cannot be fixed at the local service center, the amplifier will be repaired at the plant within a maximum of ten working days (plus shipping time).

Extended warranty for maximum protection of investment

The extended warranty offers optimal performance and availability of an R&S®BBA150 broadband amplifier at low, calculable operating cost. The terms of one to four years (WE1 to WE4) – in addition to the three-year warranty – provide long-term investment protection.

From pre-sale to service – at your doorstep

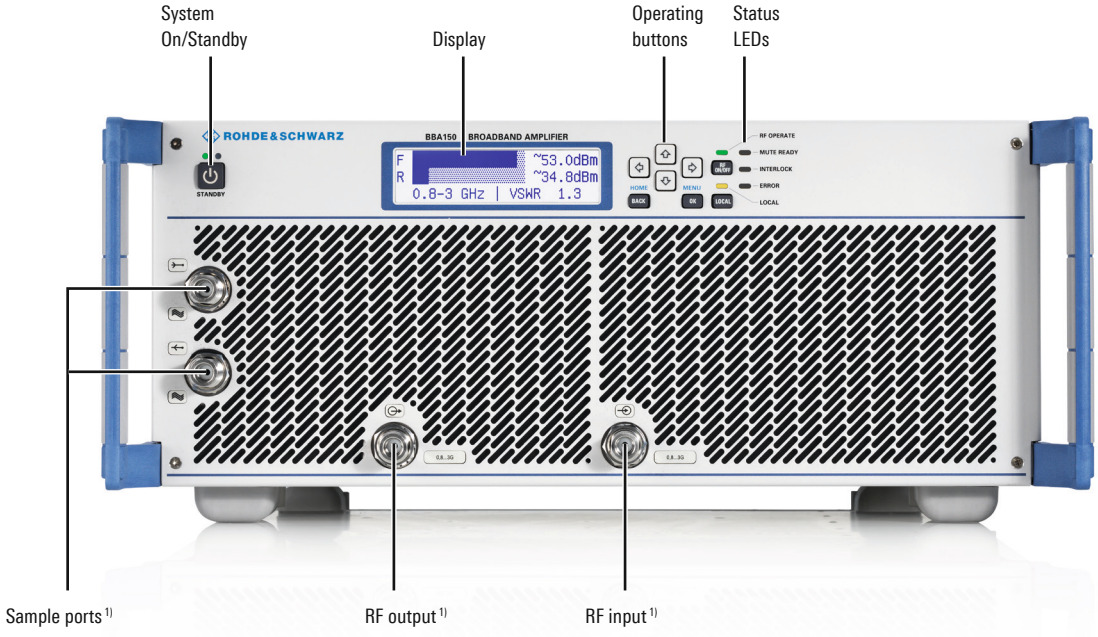
Rohde&Schwarz is a technology group of companies with a global presence. More than 9000 employees maintain direct customer contact in over 70 countries. The Rohde&Schwarz network in over 70 countries ensures optimum on-site support by highly qualified experts. The user risks are reduced to a minimum at all stages of the project:

- Solution finding/purchase
- Technical startup/application development/integration
- Training
- Operation/calibration/repair

Rohde&Schwarz has the experience needed to offer all customers a customized solution tailored to their requirements.

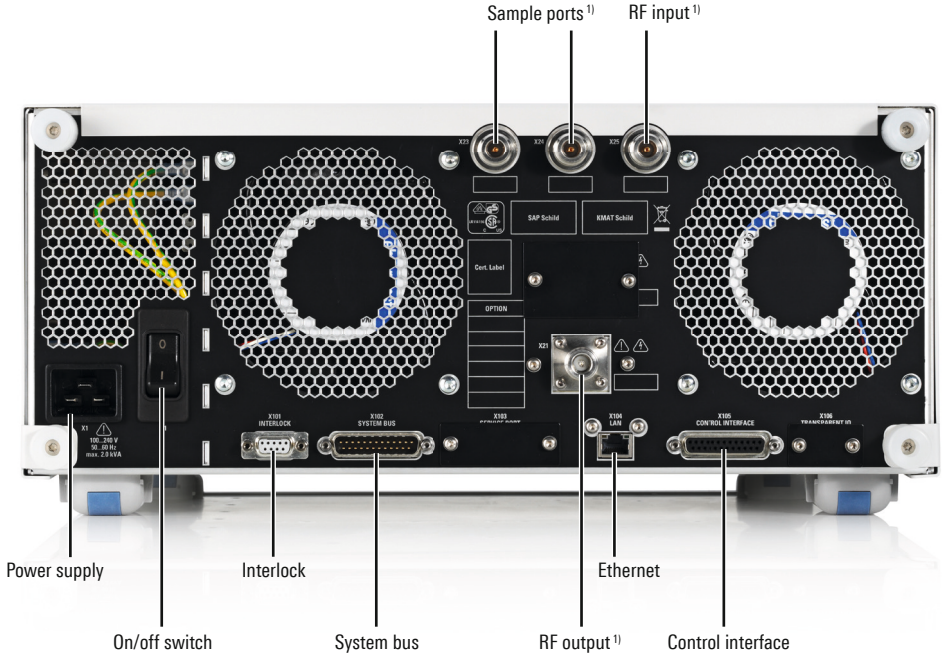
Functional elements
Desktop model

Front view



1) Optional or configuration-dependent.

Rear view



1) Optional or configuration-dependent.

Specifications in brief

Specifications in brief		
RF specifications		
Frequency bands		▮ 9 kHz to 250 MHz, instantaneously ▮ 80 MHz to 1.0 GHz, instantaneously ▮ 0.8 GHz to 3.0 GHz, instantaneously ▮ 2.5 GHz to 6.0 GHz, instantaneously
Nominal output power	9 kHz to 250 MHz	125 W to 2500 W
	80 MHz to 1.0 GHz	70 W to 3000 W
	0.8 GHz to 3.0 GHz	30 W to 400 W
	2.5 GHz to 6.0 GHz	15 W to 200 W
Nominal output load		50 Ω
Gain flatness		±3.5 dB (or better; see data sheet)
Gain adjustment range		> 15 dB
Modulation capability		AM, FM, φM, PM
Nominal input impedance		50 Ω
Input level for nominal output power		–3.4 dBm
Nominal output impedance		50 Ω
Output mismatch tolerance, VSWR		100%
RF and sample connectors		
RF input port		N female
RF output port		N female, 7/16 DIN female or 1 5/" EIA female
RF sample ports	forward output power, optional	N female
	reflected output power, optional	N female
Detected sample ports	forward output power, optional	N female
	reflected output power, optional	N female
Graphical user interface		
Local graphical display		200 × 48 pixel, monochrome
Web GUI	via Ethernet	RJ-45, 10/100 Mbit/s, autonegotiation, half/full duplex
Remote control		
Ethernet		RJ-45, 10/100 Mbit/s, autonegotiation, half/full duplex
General data		
Operating voltage range		100 V to 240 V AC ± 10%, single phase, 50 Hz to 60 Hz ±6%
	R&S®BBA150-BC500	200 V to 240 V AC ± 10%, single phase, 50 Hz to 60 Hz ± 6%
	R&S®BBA150-A1300/-A2500/-BC1000/-BC1250/-BC1500/-BC2000/-D400	380 V to 415 V AC ± 10%, three phase, with N, 50 Hz to 60 Hz ± 6%
Air cooling		forced air, built-in fans, air entry at front, air exit at rear
Dimensions		
Desktop model	incl. fans, handles and feet; W × H × D	430 mm × 196 mm × 580 mm (16.93 in × 7.72 in × 22.83 in)
	for rackmounting	19" 1/1, 4 HU
Rack models (W × H × D)	R&S®BBA150-BC1000/-D400	19" × 12 HU × 800 mm (31.5 in)
	R&S®BBA150-A1300/-BC1250/-BC1500/-BC2000	19" × 20 HU × 1000 mm (39.4 in)
	R&S®BBA150-A2500	19" × 35 HU × 800 mm (31.5 in)
	R&S®BBA150-BC3000	19" × 35 HU × 1000 mm (39.4 in)

Specifications in brief		
Environmental conditions		
Temperature loading	operating temperature range	0 °C to +40 °C
	storage temperature range	–20 °C to +70 °C
Damp heat		max. +40 °C at 95 % rel. humidity, without condensation
Altitude	operating altitude	up to 2000 m
	storage altitude	up to 4600 m
Protection		
Input overdrive, without damage		max. +15 dBm
	9 kHz to 250 MHz	max. +5 dBm
Load VSWR		infinite
Interlock		1 device interlock, 1 configurable interlock
Input protection against bias voltage	optional	DC block level ≤ 50 V DC
Transient voltage compatibility		category II, in line with IEC 60364-4-443
Short-circuit breaking capacity		automatic all-pole 20 A circuit breaker
Thermal overload		shutdown in case of thermal overload

All specified parameters are valid for an ambient temperature of +25 °C, input impedance of 50 Ω and output impedance of 50 Ω.

For data sheet, see PD 3606.7247.22 and www.rohde-schwarz.com

Ordering information

Designation	Type	Configuration No.
R&S®BBA150 single-band power amplifiers		
Frequency band from 9 kHz to 250 MHz		
125 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A125
160 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A160
200 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A200
1300 W, air-cooled, 20 HU rack model	R&S®BBA150	BBA150-A1300
2500 W, air-cooled, 35 HU rack model	R&S®BBA150	BBA150-A2500
Frequency band from 80 MHz to 1.0 GHz		
70 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-BC70
125 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-BC125
160 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-BC160
250 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-BC250
500 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-BC500
1000 W, air-cooled, 12 HU rack model	R&S®BBA150	BBA150-BC1000
1250 W, air-cooled, 20 HU rack model	R&S®BBA150	BBA150-BC1250
1500 W, air-cooled, 20 HU rack model	R&S®BBA150	BBA150-BC1500
2000 W, air-cooled, 20 HU rack model	R&S®BBA150	BBA150-BC2000
3000 W, air-cooled, 35 HU rack model	R&S®BBA150	BBA150-BC3000
Frequency band from 0.8 GHz to 3.0 GHz		
30 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D30
60 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D60
110 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D110
200 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D200
400 W, air-cooled, 12 HU rack model	R&S®BBA150	BBA150-D400
Frequency band from 2.5 GHz to 6.0 GHz		
15 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-E15
30 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-E30
60 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-E60
100 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-E100
200 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-E200
Accessories supplied: power cord, user manual on CD.		
R&S®BBA150 dual-band power amplifiers [1)]		
Frequency bands from 9 kHz to 250 MHz and from 80 MHz to 1 GHz		
125 W/70 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A125BC70
125 W/125 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A125BC125
125 W/250 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A125BC250
160 W/160 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A160BC160
200 W/70 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A200BC70
200 W/125 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-A200BC125
Frequency bands from 0.8 GHz to 3.0 GHz and from 2.5 GHz to 6.0 GHz		
30 W/15 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D30E15
30 W/30 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D30E30
60 W/15 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D60E15
60 W/30 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D60E30
60 W/60 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D60E60
110 W/30 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D110E30
110 W/60 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D110E60
110 W/100 W, air-cooled, 4 HU desktop model	R&S®BBA150	BBA150-D110E100
Accessories supplied: power cord, user manual on CD.		

Designation	Type	Configuration No.
Options		
GPIB Remote Control, external converter	R&S®BBA-B101	5355.8250.02
GPIB Remote Control, for racks up to 30 HU	R&S®BBA-B101	5355.8250.03
GPIB Remote Control, for racks higher than 30 HU	R&S®BBA-B101	5355.8250.04
RF Input Switch (1:2 or 2:1, N)	R&S®BBA-B110	5355.8866.02 [2)]
RF Input Switch (1:6, N)	R&S®BBA-B116	5355.8950.02
RF Output Switch (2:1 or 1:2, N)	R&S®BBA-B120	5355.8795.02 [2)]
RF Output Switch (2:2, 7/16)	R&S®BBA-B121	5355.8895.02 [2)]
RF Output Switch (6:1, N)	R&S®BBA-B126	5355.8995.02
Fast Amplifier Mute	R&S®BBA-B130	5355.8114.02
DC Block Input Protection (N)	R&S®BBA-B132	5353.9236.03
RF Forward/RF Reflected Sample Ports (N front)	R&S®BBA-B140	5355.8837.02
RF Forward/RF Reflected Sample Ports (N rear)	R&S®BBA-B140	5355.8837.03
Detected Forward/Detected Reflected Sample Ports (N front)	R&S®BBA-B141	5355.8850.02
Detected Forward/Detected Reflected Sample Ports (N rear)	R&S®BBA-B141	5355.8850.03
Sample Port Switch (dual-port, N front)	R&S®BBA-B142	5355.8872.02
Sample Port Switch (dual-port, N rear)	R&S®BBA-B142	5355.8872.03
Transparent I/O	R&S®BBA-B160	5355.8889.02

[1)] Amplifier systems with two or more frequency bands are available in many combinations. The table shows only a selection of the multiband power amplifiers.
[2)] The last two digits of the order number depend on the system configuration.

Service options		
Frequency Range/Output Power Upgrade	R&S®BBA-UPGR	on request
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty, three years	R&S®WE3	
Extended Warranty, four years	R&S®WE4	

Your local Rohde&Schwarz expert will help you determine the optimum solution for your requirements.
To find your nearest Rohde&Schwarz representative, visit
www.sales.rohde-schwarz.com

Service that adds value

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

About Rohde&Schwarz

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. Founded more than 80 years ago, this independent company has an extensive sales and service network and is present in more than 70 countries. The electronics group is among the world market leaders in its established business fields. The company is headquartered in Munich, Germany. It also has regional headquarters in Singapore and Columbia, Maryland, USA, to manage its operations in these regions.

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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R&S®BBA150 Broadband Amplifier

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